



History and Discovery of Asteroids

Mystery Asteroid

TEACHER GUIDE – ASSESSMENT

BACKGROUND

Throughout this module, students have charted the course of the history and discovery of asteroids from the earliest discovery of the “missing planet” and its location within the asteroid belt to the modern era of robotic space missions. Along the way, they learned about processes and technology scientists have used to study asteroids. Students also experimented with some of these processes to discover for themselves the known physical characteristics of asteroids. All of these learning activities helped students see the Dawn mission in a broader context as part of the progression of history and the nature of inquiry in science.

The opportunity to engage in discovery continues in this section as students apply their new knowledge and skills by making observations, inferences, and conclusions about a “mystery asteroid.” The assessment provides students with a Hubble Space Telescope picture of this “mystery asteroid,” and then later presents some facts. Students’ responses to the assessment questions will allow the teacher to evaluate their understanding of the concepts and content presented in this module (i.e., albedo, the affects of technological advances and limitations on asteroid discovery, etc.). What’s more, not only do students answer questions, the assessment encourages students to ask the questions. In doing so, students come to realize the necessity for building upon science and searching for answers by sending a spacecraft to further investigate asteroids. Students will see the Dawn mission to Vesta and Ceres as a necessary and logical next step in the scientific quest for gaining insight into planetary formation.

The “mystery asteroid” presented is in fact Ceres, however, it may be best to wait until the assessment is completed to reveal the asteroid’s identity. While identifying the “mystery asteroid” is not a goal of this assessment, it may be fun for students to try to make an educated guess. Teachers who want to hold an “Identify the Mystery Asteroid” contest or want to recognize students for making an educated guess or doing an outstanding job on the assessment can present students with [Reward Certificates](#).

Allowing students to use materials and information from previous assignments during the assessment is recommended. Knowing the dynamics of each class, the teacher should determine the best way to administer the assessment. Which module materials or information resources students may refer to during the assessment and whether students work individually or collaborate with a partner are some of the factors the teacher should consider.

REFER TO THE LAST PAGE OF THIS TEACHER GUIDE FOR SPECIFIC STANDARDS ADDRESSED

MATERIALS

- A copy of the “[Mystery Asteroid Assessment](#)” for each student
- Ruler or compass (optional – students may want to measure the pictures of the asteroid for the sake of comparison)
- Any module materials that the teacher allows as references during the assessment (ask students to bring pertinent materials)
- “[Mystery Asteroid Assessment Answer Key](#)” for teacher reference

PROCEDURE

1. Pass out a copy of the “Mystery Asteroid Assessment” to each student.
2. Make sure students understand that this is an assessment assignment. Review the following with them:
 - a) Whether you intend for the assessment to be done by individuals or as a collaborative effort.
 - b) What information sources they are allowed to use during the assessment—not only student texts from previous module activities, but also print and/or electronic resources used during this module.
 - c) When the assessment is due.
 - d) The criteria that will be used to evaluate the assignment.
3. Review the directions at the top of the first page of the assessment. Emphasize that these are two pictures of the same asteroid. Tell students to look carefully at the two pictures, and then ask them a simple yes-or-no question such as, “Do the two pictures look exactly the same?” This will get them to start analyzing the pictures with a critical eye to notice details, tune into the minor differences between the images, and then start drawing some preliminary conclusions.
4. Before students begin to write any responses, ask them to turn to item #6 on the assessment. Explain that there is no wrong answer as long as their answer is supported by thoughtful, thorough explanations or evidence.
5. Then, ask students to look at item #7. They may be unaccustomed to answering a “test” question by asking questions. Emphasize that as long as the questions are related to the content, (i.e., no questions such as, “What’s for lunch?” or “When is spring break?”), there are no silly questions. Students should try to list as many RELEVANT questions as they can.
6. Because there are many possible correct “answers” on the assessment items, teachers may want to refer to the attached “Mystery Asteroid Assessment Answer Key” for a list of responses to help assess students’ understandings of the module content and concepts. Some responses in the “Answer Key” are quite advanced and will probably not appear in most middle school students’ responses. They are included to give teachers a sense of the full range of possible responses.

Teacher Guide Appendices For Assessment Section

APPENDIX A—STANDARDS ADDRESSED

From *National Science Education Standards*:

Grades 5-8

Science as Inquiry

Understandings about Scientific Inquiry

- Different kinds of questions suggest different kinds of investigations
- Current scientific knowledge and understanding guides scientific investigations
- Mathematics is important in all aspects of scientific inquiry
- Technology used to gather data enhances accuracy and allows scientists to analyze and quantify results of investigations
- Scientific explanation emphasizes evidence
- Scientific investigations sometimes result in new ideas for study

Physical Science

Transfer of Energy

- Light interacts with matter by reflection. To see an object, light from that object must enter the eye.

Earth and Space Science

Earth in the Solar System

- The Earth is the third planet from the Sun in a system that includes the moon, the Sun, eight other planets and their moons, and smaller objects such as asteroids and comets.
- Most objects in the solar system are in regular and predictable motion.

Science and Technology

Understandings about science and technology

- Scientific inquiry and technological design have similarities and differences
- Science and technology are reciprocal
- Perfectly designed solutions do not exist
- Technological designs have constraints

History and Nature of Science

Nature of Science

- Scientists formulate and test their explanations of nature using observation, experiments, and theoretical and mathematical models.